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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/726,860 | 11/30/2000 | Etsuo Morita | 09792909-4715 | 1967 |

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EXAMINER

ANDERSON, MATTHEW A

| ART UNIT | PAPER NUMBER |
|----------|--------------|
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1765

DATE MAILED: 02/04/2003

14

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/726,860

Applicant(s)

MORITA, ETSUO

Examiner

Matthew A. Anderson

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 30 October 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 7-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 7-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 30 November 2000 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-3, 5, 7- 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kiyoku et al. (US 6,153,010) in view of Sugiura (US6,015,979).

Kiyoku et al. discloses methods of growing nitride semiconductors. Figs. 6a-6C show an embodiment of the methods presented. The method is described in col. 13 (lines 25+) and col. 14 lines 1-65. A monocrystalline substrate (11) is overlaid with an underlayer (also known in the art as a buffer layer). The material choices for the substrate are given as sapphire (known chemically as Al_2O_3), spinel (chemically, MgAl_2O_4), SiC of any of the 6H, 4H and 3C polytypes, ZnS, , GaAs, Si, and (although they are less preferred) ZnO or $\text{La}_x\text{Sr}_{1-x}\text{Al}_y\text{Ta}_{1-y}\text{O}_3$. (see col. 7 lines 20-25.) The buffer layer can be AlN, GaN, AlGaN, or InGaN. (col. 13 lines 10-20). The mask is described as being one or a combination of oxides and nitrides such as silicon dioxide (SiO_2), silicon nitride (Si_3N_4), titanium oxide (TiO_2) and zirconium oxide (ZrO_2). Also the metals with melt in points greater than 1200°C can be used. These include W, Ir, Pt, Ti

etc. Stripe, dots or lattice patterns are disclosed for the mask in col. 8 lines 25-35. In col. 14 lines 33-40 it is disclosed that repeated cycles of growth mask formation followed by nitride growth. Polishing the grown nitride is disclosed in col. 13 lines 25-40 to provide a flat growth surface before additional growth iterations are performed. In col. 12 lines 5-15 it is disclosed that the dissimilar substrate (i.e. the basal layer) may be removed from the formed device. The use of a superlattice or graded buffer layer (the first crystal layer) is described in col. 20 lines 20-30 as formed from alternating nitride layers having different compositions.

Kiyoku et al. does not suggest the same method of forming the growth masks as is used in the application.

Sugiura et al. discloses the formation of growth masks for nitride epitaxy as in Fig. 11. This is disclosed in col. 18 lines 9-35 as consisting of a nitride layer on which a SiO₂ layer is formed. This layer is then patterned using a electron beam resist and patterned using a dry etching technique. This suggests etching the underlying nitride layer since the oxide is completely etched through to expose the underlying layer.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to combine the references cited because Kiyoku et al. discloses the formation of patterned striped growth masks on a nitride layer and Sugiura et al. discloses an alternative method of forming such masks on a nitride layer and such formed masks would have been anticipated to produce an expected result. The motivation for the combination is the increased process flexibility thus afforded.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to perform a second growth step through the etched mask and the etched first crystal (i.e. buffer layer) because this was the essence of Kiyoku et al.'s disclosure concerning the Figs. 1A-1C with the modification of Sugiura as above.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to perform a second mask formation step, a second etching step to form the second layer through the second pattern and a third nitride growth step because this was the essence of Kiyoku's Figs. 6A-6C with the above modification of Sugiura et al.

It would have been obvious to one of ordinary skill in the art at the time of the present invention that the second etching step include removing at least part of the mask pattern because such removal of parts of the mask pattern is suggested by Sugiura et al..

It would have been obvious to one of ordinary skill in the art at the time of the present invention that the mask pattern include an underlayer and an upper layer because Kiyoku et al. discloses multi-layer growth masks.

It would have been obvious to one of ordinary skill in the art at the time of the present invention that the windows of the first mask and the second mask do not overlie one another in the direction of the thickness of the crystal because such mask overlay is shown in Fig. 6A-6C.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to remove the basal layer after the growth of the device layers of nitride is completed because such is suggested by Kiyoku et al.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to form a buffer layer of alternating nitride layers because such is suggested by Kiyoku et al. in such an epitaxial process.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to form the first mask layer in stripes arranged in one direction in a plane almost parallel to the surface of the basal plane because Kiyoku et al. discloses flattening the layer before subsequent growth and such planarization would have been anticipated those of ordinary skill in the art to produce a better surface.

It would have been obvious to one of ordinary skill in the art at the time of the present invention that the first and second mask pattern include elements arranged in two directions in a plane almost parallel to the surface of the basal body (i.e. in a lattice pattern) because such is explicitly suggested by Kiyoku et al.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to use silicon oxide or silicon nitride masking materials because such were explicitly suggested by Kiyoku et al.

It would have been obvious to one of ordinary skill in the art at the time of the present invention to use a substrate (i.e. basal body) of sapphire, or SiC or GaAs etc. because such is disclosed by Kiyoku et al.

Response to Arguments

Applicant's arguments filed 10/30/2002 have been fully considered but they are not persuasive.

The argument that the second mask overlies the window in the first mask is not convincing. This is directly disclosed in Fig. 6A-6C of Kiyoku et al.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

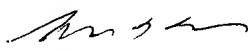
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew A. Anderson whose telephone number is (703) 308-0086. The examiner can normally be reached on M-Th, 6:30-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

MAA
January 28, 2003


BENJAMIN L. UTECH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700